QUALITY PROPERTIES OF VIETNAMESE COCOA LIQUORS

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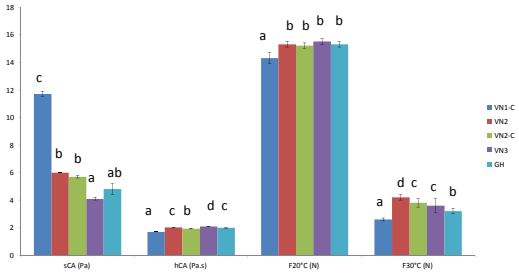
Introduction

Vietnam (VN) is an emerging country targeting cocoa as a potential industrial domain. It is however still unclear how the quality of VN cocoa liquors can be positioned in the world cocoa supply. Three VN cocoa liquors exhibiting high to intermediate acidity (pH: 4.7 – 5.2) were selected to produce dark chocolate (48.0% sugar, 17.6% cocoa solids, 34.0% cocoa butter and 0.4% lecithin). A comparison study was conducted to investigate the difference between VN and Ghanaian (GH; pH: 5.6) dark chocolates in terms of Casson flow properties (yield stress σ_{CA} and viscosity η_{CA}), hardness ($F_{20°C}$ and $F_{30°C}$), water-soluble organic acid content, aroma profile and sensory evaluation. The impact of pre-treatments of cocoa liquor by ball-milling at different fat contents and conching (-C) was also examined.

Flow properties and hardness



Correlation: σ_{CA} and D_{43} (R = -0.95)

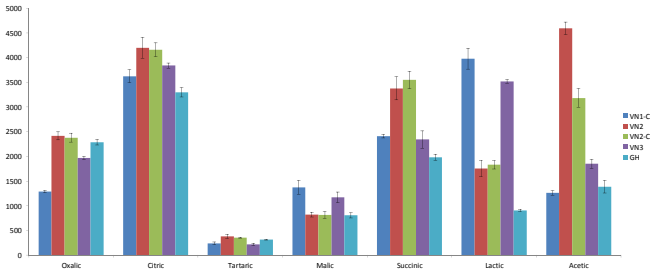
VN1-C was discriminated from the others due to smaller particles which is attributed to pre-treatment with ball-mill at low fat content and results in a significantly higher σ_{CA}.

In addition, more free fat was created during ball-milling and pre-conching which results in a significantly lower η_{CA} and hardness $F_{20°C}$ and $F_{30°C}$.

Organic acid content

Acidic flavour perceived by the trained panel

VN1-C	VN2	VN2-C	VN3	GH
6.1 ± 1.6^{b}	4.5 ± 2.4^{a,b}	5.1 ± 1.7^{b}	4.5 ± 2.0^{a,b}	2.5 ± 1.2^{a}



Correlation: pH and lactic + acetic acid content (R = -0.78)

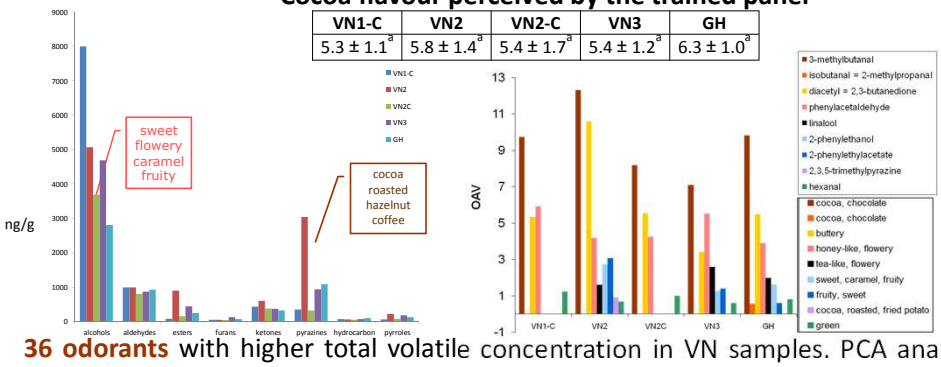
With exception of oxalic, succinic and tartaric acid, all other major water-soluble organic acids in Vietnamese liquors dominated over those in GH sample, but only 2 VN samples were differentiated from GH by trained panel in acidic flavour. → Optimisation of fermentation and roasting conditions is crucial to overcome this.

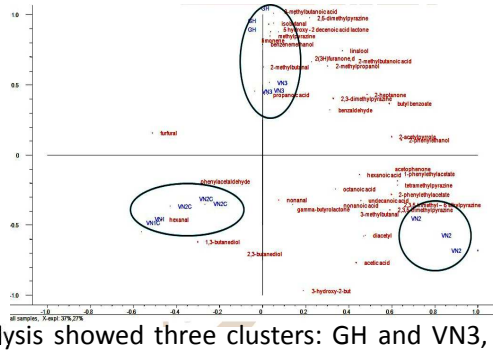
Aroma profile

HS SPME GC–MS profiles using fiber coated with DVB/CAR-PDMS

Cocoa flavour perceived by the trained panel

VN1-C	VN2	VN2-C	VN3	GH
5.3 ± 1.1^{a}	5.8 ± 1.4^{a}	5.4 ± 1.7^{a}	5.4 ± 1.2^{a}	6.3 ± 1.0^{a}





36 odorants with higher total volatile concentration in VN samples. PCA analysis showed three clusters: GH and VN3, VN2-C and VN1-C, and VN2. Pre-treatment by conching reduced the concentrations of a number of desirable compounds.

Conclusions

Three VN liquors perceived comparable physicochemical properties to the one of GH regarding σ_{CA}, η_{CA} and $F_{20°C}$. $F_{30°C}$ was more discriminative due to differences in melting resistance of cocoa butter. Regardless the abundant acids, most VN chocolate exhibit a more profound fruity, flowery aroma and a comparable cocoa, buttery, roasted and hazelnut-like notes in comparison with GH.

Dark chocolate produced by VN liquors were of high quality in terms of processability, thermal resistance and aroma profile. However, the high acidity might mask the overall flavour.
Therefore, optimisation of fermentation and roasting process to reduce acidity is recommended.

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